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**MARKET DAY IN ECUADOR—Some of These Women Will Sell "Panama" Hats Manufactured in Village Homes. Others Wear Them—or Derby-Shaped Straw Creations**

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MULFORD B. FOSTER

The train winds through and over tumbling mountain shoulders which thrust upward to form Ecuador's high-ridged spine. Climbing to 11,841 feet, engines haul travelers from tropical to alpine climate in a day.

Mountain ranges make a tire-chain pattern on Ecuador's face. Eastern and western ridges, running north and south from 25 to 40 miles apart, are linked by east-west cross ranges. Result: a series of 7,000- to 9,000-foot-high basins, surrounded by high-reaching peaks.

Rivers draining these basins flow either east or west, for South America's continental divide passes through them. Drop a tadpole into one stream and he will be whisked to the Pacific coast before he's had time to grow legs. Place him in another creek and he might make his way to Atlantic shores—but he'd be a grandfather frog when he arrived.

Sixty percent of Ecuador's population (about 3,464,000) live in these lofty depressions. It was to serve them and provide an outlet for their produce that Eloy Alfaro, twice president of Ecuador, accomplished the seemingly hopeless task of having the railroad driven through. The roadbed negotiates cliffs "impassable even to goats."

The iron rails slice past Andes summits, many of which top 16,000 feet. Trains loop close under soaring Chimborazo (20,577 feet), once thought to be the world's highest mountain. Four of these rugged crests are active volcanoes. One, 17,749-foot El Sangay, erupted in 1946.

Meandering close to the Pan American Highway, the railroad reaches Quito. Once a battleground of Incas and Spaniards, Quito rates as

**This National Geographic Map shows Ecuador's main railroad winding through Andes communities. North of Quito, from Ibarra, a section now being completed will run northwest to the Pacific coast near the Colombian border, 350 miles closer to the Panama Canal than Guayaquil.**

FENNO JACOBS FROM THREE LIONS

**MILLIONS OF BANANAS PASS THROUGH GUAYAQUIL, Ecuador's Chief Port. Many of the Nation's Exports Will Be Shipped from San Lorenzo When Railroad Is Finished**

# Ecuador's Railroad Binds Andes Settlements

The Equator, that "menagerie lion running around the middle of the world," as a young student once defined it, cuts across the northern part of the country that bears its name—Ecuador.

Another line, far from imaginary, angles up from the southwest to cross the Equator high in the Andes and veer back toward the Pacific Ocean. This is the spectacular railroad, already linking Quito, Ecuador's capital, with the bustling southern seaport of Guayaquil. Soon it will be completed between Quito and the northern port of San Lorenzo.

A ride on this railroad would offer a varied glimpse of the mountainous land which gave the world "Panama" hats (made in Ecuador) as well as providing a rich storehouse of bananas, coffee, cacao, and rice.

From Guayaquil, boasting iron and steel works, shipyards, and cotton mills, the line passes coastal marshes, foothills, and dense tropical rain forests. Then the mighty Andes loom before the eyes of passengers.

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# Wild Horse Round-up in England's West

Snorting, pawing, shouldering each other, shaggy ponies of England's "West Country" crowd pens at Bampton Fairground. A few days before, they foraged freely on the wide plateau of Exmoor—the *Lorna Doone* country that overlaps the counties of Somerset and Devonshire. They roamed bleak moors, each pony bearing a brand, yet all as wild as the winds that rustle inland from near-by Bristol Channel.

Then their owners, farmers, professional breeders, or perhaps simply wandering gypsies, mounted trained ponies of the same kind for a round-up. Hoofs drummed through heather, tails and manes whisked as the wild ones were herded together in a British counterpart of a Wild West scene.

Now, combed and curried, they wait in their pens for the famed pony sale at Bampton Fair. Prospective purchasers forego the delights of boxing matches and elude the blandishments of fortunetellers—all part of the fair. While a calliope wheezes in the background, buyers wander over to the horse pens to drive a bargain—as they have done since the 13th-century reign of Henry III when wild ponies were first sold.

Soft West Country voices haggle over the right price, then clinch deals. Each new owner extracts his beast from the pens and gets it home as best he may. He will train it for whatever job he has in mind. It may pull a vegetable cart, do light farm chores, or work in a mine. A few lucky ponies may end up as much-loved pets for boys and girls. Others, unsold, are turned loose to become for another year the wild ponies of Exmoor.

*National Geographic Magazine*—Jan., 1946, "England's Wild Moorland Ponies" (75¢)

BODO WUTH

**APPLYING MAKE-UP—This Friendly Indian from Northwest of Quito Has Plastered His Hair with Dressing and Trimmed It Like a Cap**

third-oldest capital in the Western Hemisphere. Only Mexico City and Cusco, Peru, first Inca capital, outrank it. A cultural center of some 210,000, Quito has an airport, wireless station, and university.

Yet east of this thriving city and still within the borders of Ecuador—the nation is slightly smaller than Colorado—roam Indians who are totally unaffected by civilization's march. In breathlessly hot jungles that shroud Amazon headwaters, Jivaro headhunters stalk game and tribal enemies through matted forests that ring with the cries of bright-hued birds. Jivaros have stubbornly resisted white men's intrusion.

C.I.A.A.

Even these fierce savages avoided tangling with their northern neighbors, the Auca Indians, believed to have slain five American missionaries recently. Stout, long-haired Auca warriors daub themselves with bright clay and slip phantomlike through steaming jungle paths only about 100 miles from Quito's busy streets.

**RESTING BEFORE THE CLIMB**

**Ecuador Train Pants at a Mountain Station on the Way up a Series of Tortuous Switchbacks**

**National Geographic References**

*Map*—South America (paper 50¢, fabric $1)

*Magazine*—Jan., 1950, "El Sangay, Fire-breathing Giant of the Andes" (75¢)
Feb., 1949, "Sea Fever" (75¢)
Mar., 1946, "Quinine Hunters in Ecuador" (75¢)

RICHARD HARRINGTON (LEFT, RIGHT, AND ABOVE)

The white man brought other additions, too. Villagers near trading posts or towns now own cameras, radios, and sewing machines. A few have replaced smoky driftwood or seal-oil fires with stoves.

But no matter how they heat their homes, Eskimo wives still thaw frozen fish (above) as they have for centuries. When hungry families come to dinner, they might find the fish cooked or raw. The word "Eskimo" means "eater of raw flesh."



Many Eskimos live almost entirely on an all-flesh diet of fish, whale, seal, and walrus. In the spring they sometimes get a few berries or crisp green shoots that add a little variety.

Resourceful Eskimos use almost every animal scrap. Skilled craftsmen carve cooking utensils, weapons, and needles from walrus ivory. Hides become beds and summertime tents, as well as clothes.

Wives and daughters chew tough sealskin to make it soft and pliable enough for mittens and boots (below).

VAGN HANSEN

Like others who still live in igloos built of snow blocks, this mother and daughter have covered inside walls with wood, canvas, and burlap. But most Eskimos build homes of wood or stone and sometimes cover them with earth.

Inside homes or on snow-rimmed seashores, mothers, like the one above, carry babies on their backs under warm parkas.

Before this little Eskimo boy is big enough to hurl kakivaks like Charlie Kohktah, probably many more changes will take place in his hardy people's age-old customs.

*Life in the Arctic—*

# Land of the Eskimos

A beaming smile and a big catch end Charlie Kohktah's day of fishing. Proudly he holds up a prize Arctic char gripped in the prongs of a giglike *kakivak*.

As July sun cracks huge cakes of ice from shores along Spence Bay in Canada's Northwest Territories, Charlie and other Eskimos cut holes through chunks of ice three to four feet thick. Then they watch and wait. A long char glides into view. Zing! A kakivak whips through the hole and hits its mark.

NATIONAL GEOGRAPHIC PHOTOGRAPHER JOHN E. FLETCHER

Scenes like this take place all along America's extreme northern coasts and off shores of near-by islands from Alaska to Labrador. Here live about 48,000 Eskimos, including Greenlanders.

In subzero winter, Eskimos peek through fur ruffs (left) that help shield their faces from biting blasts of snow-laced wind.

At one time almost all of them wore only baggy parkas, trousers, and *mukluks* (boots) of sealskin or caribou hide. The fur always went next to the body for extra warmth.

But as ships and airplanes carried white man's goods into the Arctic, many Eskimos started supplementing age-old costumes with such clothes from the newcomers as woolen caps and stockings. Women began wearing bright cotton dresses over drab parkas.

water drains to fill the reservoir, the company bought 575 square miles of the watershed.

Gravity pulls this soft mountain water to east bay cities. Twin above-ground pipelines more than five feet in diameter carry 100,000,000 gallons a day through the hills and across San Joaquin Valley. Pumping stations can more than double this amount, providing enough water for twice the present population of 1,000,000 people.

Four storage reservoirs in outlying areas receive this water, or it may be treated at a filter plant for immediate use. Enough can be stored to provide a 300-day supply.

Coming from a protected source, the water is about 98 percent pure to begin with. A long period of storage further purifies it. Then follows filtering, a process including aeration (spraying water into sunlit air); coagulation (adding alum to attract impurities); sedimentation (allowing coagulated masses to settle); filtration (straining the water through sand filters to remove the remainder of suspended foreign matter); and finally, disinfection (adding a small, unnoticeable amount of chlorine gas).

Now the water for Mike's bath is ready to enter the distribution main. It flows through a tunnel and then branches into one of three large transmission lines. Because Mike lives on the west slope of the range of hills overlooking the bay, his water enters a pumping station

**IRRIGATION MAKES UNCLE SAM A SUGAR PRODUCER—Mountain Water Spread on the Dry but Fertile Plains of Montana Results in Big Yields of Sugar Beets**



MONTANA STATE HIGHWAY COMMISSION

UMI

Everyday Wonders, No. 5

# Water Supply

W. E. GARRETT, NATIONAL GEOGRAPHIC STAFF

Turn on the tap and there is water, plenty of it, pure enough to fill baby's drinking cup.

What could be simpler, more taken for granted? Yet, what is more of a modern miracle—once you really think of it?

We have come to regard water in the same terms as air—one of God's free, unlimited gifts to earth. But water, unlike air, is not everywhere in the right amount all the time. Hence, water supply—the engineering art of bringing water from nature's table to the places where man wants it when he wants it. Imagine New Yorkers drawing daily needs from wells, springs!

Though ancient Rome had its aqueducts leading to public baths and palaces, water supply as we know it today—offering pure running water for every citizen's house—is a modern development.

What engineering marvels are set in operation when Mike, the happy boy above, turns on the faucet? He doesn't know it, but behind the bath water spilling through his fingers lies a watershed in the Sierras half as big as Rhode Island, a 358-foot-high dam, a 94-mile aqueduct, a storage reservoir, a purification plant, a 3½-mile tunnel, a pumping station, a distribution reservoir, and thousands of feet of underground main or pipe.

Mike lives in Oakland, California. His water-supply system is typical of many in today's well-planned municipal districts, and it serves as a model for those cities where improvements must be made to keep abreast of growing population. When Mike's parents were children, citizens of Oakland and eight adjoining cities on the east side of San Francisco Bay voted to pool resources and create one single water system. The object was to supply the cities more cheaply than could small competing companies, and to prepare for future growth.

The group built Pardee Dam in a narrow, solid-rock canyon of the Mokelumne River in the foothills of the Sierra Nevada. As snows melted on higher mountains the reservoir behind the dam filled with 68 billion gallons of water, covering 2,200 acres. To protect the area from which

Mike will learn that throughout the nation and the world this is man's big problem relative to water: to have it where he wants it when he wants it. Water supply provides part of the answer. Where engineered systems are lacking, want develops, hardship results, and disease spreads. Water carrying still ranks as one of mankind's major burdens (below). In some regions water is precious enough to be sold in the market place like jewels.

Water shortages even in eastern United States have made headlines in recent years. These usually have resulted from unwise use of ground water or inability to keep up with the rising birth rate. Half the people of the United States live in growing cities—on less than two percent of the nation's land area. They all need water.

Actually there is plenty of water on earth for man's needs, granted proper distribution. Also, water is unlike any other resource in that it can be, and is, used over and over again. We are drinking and using the same water now that existed when the earth was born. As it evaporates into the atmosphere, forms clouds, and falls again as rain, it constantly repurifies itself.

But Americans have not been termed "water gluttons" for nothing; we use our liquid assets in prodigal amounts, and every year there are more thousands demanding a share. Fearing the nation may someday be water-poor, the government is considering a water-control authority.

Individuals can help conserve water by fighting river pollution, by not letting taps run throughout such operations as dish washing, potato peeling, or tooth brushing; by repairing leaks.

Some think nature is giving us less water. But since records have been kept, rainfall in the United States has not varied; precipitation remains at 30 inches a year. This equals nearly 10,000,000 gallons for every man, woman, and child—surely enough for Mike's baths.

**JERICHO CARRIER—In Some Regions Water Supply Has Changed Little Since Bible Times: a Daily Trip with a Jar to the Well or Spring**

NANCY LORD

***National Geographic Magazine*** Aug., 1952, "Water for the World's Growing Needs" (75¢)

U. S. DEPT. OF INTERIOR

**TRIPLE-THREAT RESOURCE—Water from Shasta Dam Generates Power, Improves Navigation, and Irrigates California Crops Before Reaching the Sea**

where it is lifted to one of a hundred distribution reservoirs.

From this final resting place on its long journey, the water flows by gravity to Mike's house. It turns the meter at the street curb, measuring exactly how much he uses, and spills into the tub as he opens the tap.

On a hot day Mike may drink as much as a half-gallon. His daily bath takes five gallons; food a much smaller amount. So he would be surprised to learn that he is responsible, so to speak, for the use of 1,100 gallons of water a day. That enormous figure is the daily per-capita consumption of water in America. Though neither Mike, nor his father, nor anyone else uses that much water directly, that amount is expended indirectly in their names to create the agricultural crops and the industrial products they use.

In southern California and many other places in the 17 western states irrigation is by far the biggest user of fresh water (page 201). Industrial cities use this universal raw material in unbelievable quantities. It takes 35 gallons to produce a pound of GEOGRAPHIC SCHOOL BULLETINS paper; 65,000 gallons to produce a ton of steel for the automobile Mike's dad takes him riding in; 10 gallons to produce every gallon of gasoline they burn; 750 gallons to produce a ton of dry cement.

American iron and steel mills use nearly five times as much water in an average day as all of New York City.

The San Francisco Bay area is fortunate in its water supply situation, but as Mike grows older he will learn of the State's over-all problems: how southern California has two thirds of the people but northern California has two thirds of the water; how the San Joaquin Valley, fertile but dry, reaches north for irrigation water. Some week end his father will drive him 200 miles north to see Shasta Dam (above). It impounds water to be transferred by river and canal for irrigating farms as far south as Fresno.

NATIONAL GEOGRAPHIC PHOTOGRAPHER VOLKMAR WENTZEL

# Cumberland Gap, Appalachian Gate to the West

To Indian tribes southeast of the Appalachians, the big dip in the great mountain wall (above) meant an easy passage to western hunting grounds. *Quasioto,* they called it—"mountains where deer are plenty."

To Daniel Boone and his axmen hacking out the Wilderness Road years later, this natural opening through the westernmost Appalachians became a doorway to the promising American West. Today, Cumberland Gap—where Virginia's sharp southwestern wedge joins Kentucky and Tennessee borders—takes on a new role. Some 20,000 acres of this scenic mountain land, including the Gap, have become the most recent National Historical Park.

Searching for settlement lands, Dr. Thomas Walker discovered Cumberland Gap in 1750. Daniel Boone reached it 19 years later, so enthralled that he called the countryside "a second paradise." Soon land-hungry easterners swarmed the Gap—20,000 in one season. George Rogers Clark passed through it en route to Williamsburg, Virginia, seeking 500 pounds of powder to win the northwest. Once lingering along the Gap, Henry Clay explained he was "listening to the tread of millions yet to come."

Not long afterward, cannon fire broke mountain stillness as the strategic Gap changed hands three times during the Civil War. Fortifications, now barely visible, surround the Pinnacle, the park's 3,000-foot focal point. From here on a clear day, visitors can view Georgia, Alabama, and North Carolina as well as Virginia, Kentucky, and Tennessee.

***National Geographic Magazine***—Dec., 1943, "Home Folk around Historic Cumberland Gap" ($1)